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ABSTRACT

A general history of the Grade 5 Educational Assessment Package of Pennsylvania is given followed by the guidelines for analysis of the data. The statistical procedures used are described, as are the sample and the sample selection process. Correlations between grade 5 and grade 7 scores are given and show the greatest stability in cognitive areas. A decline in pupil's interest in school between grades 5 and 7 is indicated. The pattern of across-time correlations for male and female groups is similar to each other and to the entire group. (RS)

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A Longitudinal Study of the Pennsylvania Grade 5 Educational Quality Assessment Package

Pennsylvania Department of Education 1972

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A Longitudinal Study of the Pennsylvania Grade 5 Educational Quality Assessment Package

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December 1972

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CHAPTER I

INTRODUCTION

Pennsylvania established the groundwork for an assessment of educational programs through legislation passed in August 1963. The State Board of Education appointed a committee to develop goals of quality education. Toward this end, the committee met with civic and professional leaders from throughout the state and consulted with Educational Testing Service. In March 1965 the following Ten Goals of Quality Education were adopted:

I. Quality education should help every child acquire the greatest possible understanding of himself and an appreciation of his worthiness as a member of society.

II. Quality education should help every child acquire understanding and appreciation of persons belonging to social, cultural and ethnic groups different from his own.

III. Quality education should help every child acquire to the fullest extent possible for him, mastery of the basic skills in the use of words and numbers.

IV. Quality education should help every child acquire a positive attitude toward the learning process.

V. Quality education should help every child acquire the habits and attitudes associated with responsible citizenship.

VI. Quality education should help every child acquire good health habits and an understanding of the conditions necessary for the maintaining of physical and emotional well-being.

VII. Quality education should give every child opportunity and encouragement to be creative in one or more fields of endeavor.

VIII. Quality education should help every child understand the opportunities open to him for preparing himself for a productive life and should enable him to take full advantage of these opportunities.

IX. Quality education should help every child to understand and appreciate as much as he can of human achievement in the natural sciences, the social sciences, the humanities and the arts.

X. Quality education should help every child to prepare for a world of rapid change and unforeseeable demands in which continuing education throughout his adult life should be a normal expectation.

The Bureau of Educational Quality Assessment (EQA) was organized in June 1967 to devise instrumentation and develop procedures for assessment. These tasks were accomplished through several phases.

Phase I

A search was carried out for suitable instruments to measure each goal. For certain goals standardized published tests were deemed adequate. In other goal areas, staff from the Bureau of Research, in cooperation with EQA staff developed and pilot tested items. In April 1968 measurement packages were administered to 5th and 11th graders. These data were item analyzed and formed the basis of the final grade 5 and 11 packages.

Variables concerning family, community and school conditions which affect pupil development were identified. Procedures for collecting this information were developed, tested and refined.

Various analytic techniques for the comparison and predictions of school means were tested and refined. Computer programs for conducting these analyses were devised and refined.

A publication, Phase I Findings (Campbell, Beers, Coldiron and Hertzog, 1968) contains extensive information regarding the measuring procedures, instruments, distribution of pupil scores, and the relationships between pupil achievements and school and community conditions.

Phase II

During October 1969 the assessment battery was administered to approximately 20,000 grade 5 and 17,000 grade 11 pupils. These students came from 355 elementary schools and 73 secondary schools in Pennsylvania. The sampling

unit was the individual school building. Stratified random sampling procedures were followed in obtaining a representative sample of Pennsylvania schools. Details are described by Hertzog, Campbell and Beers (1970).

This normative sample provided the data base for the determination of school means which, in conjunction with data from other sources--Bureau of Statistics records, teachers, and administrators--comprise the complete set of information for each building. Percentile norms were established for each goal area and all condition variables. Regression equations were developed for estimating an expected school mean at each goal. The results of these analyses and procedural descriptions are given in Campbell, Mull, Laverty, Rookey and Stank (1971). A description of the measurement of pupil, school and community conditions is provided by Russell (1971). Phase II data were also used to derive reliability (internal consistency) estimates for the various instruments. The rationale and technical properties of each instrument are described by Beers (1970). A summary of reliability and validity studies is given by Toole, Campbell and Beers (1970).

Phase III

This phase involves the actual assessment of schools. A school report is generated by computer, then is bound and delivered to each school individually by an interpreting team. Because of continued refinements in the reporting model, a manual has been prepared each year (e.g., Burson, 1972), which explains the type of information found in the school report. Assessment began in the fall of 1970 and is now in its third year.

Purpose of Longitudinal Study

The primary intent of conducting a longitudinal study was to determine the extent to which growth would occur in each goal area and the degree to

which pupils maintained their rank order with respect to each goal. A sample of 5th grade pupils from schools that were originally involved in Phase II was selected. This report describes the changes which took place over a two year span.

Summary of Instruments

A brief description of each instrument and the technical properties is given in the appendix.

CHAPTER II

GENERAL PLAN OF DATA ANALYSIS

The purpose of this chapter is to outline the general guidelines underlying the analysis of the longitudinal data. This includes a description of demographic variables from which subgroups were formed and the statistical procedures used in the analysis.

Descriptive Report of Results

This report is essentially a presentation of descriptive findings. There is no attempt to integrate the results with relevant research literature.

Description of Variables from Which Subgroups Were Formed

In addition to the total longitudinal group, analyses are presented for particular subgroups. At this point it would be well to provide a description of each variable as found on the answer forms.

SEX

I am a: Boy_____Girl_____

INTER-RACIAL EXPOSURE

This year are you in any classes or school activities with pupils whose race is different from your own?

Yes_____No_____

RESIDENCE

In what type of community are you now living? (Your teacher will help you with this item if you are not sure.)

1) In the open country or in a farming community..... _____
2) In a small town (less than 10,000 people) that is not a suburb..... _____
3) Inside a medium sized city (10,000 to 100,000 people)..... _____
4) In a suburb of a medium size city..... _____
5) Inside a large city (100,000 to 500,000 people)..... _____
6) In a suburb of a large city..... _____

7) In a very large city (over 500,000 people) ..... _____
8) In a suburb of a very large city ..... _____

RACE

Which of the following best describes you?

1) Black ..... _____
2) White ..... _____
3) American Indian ..... _____
4) Oriental ..... _____
5) Puerto Rican ..... _____
6) Other ..... _____

EDUCATIONAL LEVEL OF PARENTS

This item was completed by the teacher.

Father's Education: Code the number which represents the highest educational level reached by the pupil's father or male guardian.

Mother's Education: Code the number which represents the highest educational level reached by the pupil's mother or female guardian.

Educational levels

1) None or some grade school
2) Completed grade school
3) Some high school, but not a graduate
4) High school graduate
5) Some college, vocational, technical or business school after high school
6) Bachelor's degree
7) Master's degree
8) Some work toward a Ph.D. or professional degree
9) Ph.D. or professional degree

Fluctuation of N's

As will be noted throughout this report, the number of observations on which particular statistics are computed will vary considerably due to missing data. A frequent practice in survey studies is the isolation of cases with complete data for purpose of analysis. This enables one to have a set of data whose demographic characteristics are known and constant for all variables under analysis and which is, hopefully, not grossly unrepresentative. This practice is sometimes encouraged by the fact that the accessible computer

programs accept only complete data. In the present study missing data are too extensive to indulge in the luxury of analyzing only the subset of complete data. Considering only the goal scores at grades 5 and 7 there were 517 complete data records whereas, for the background information (sex, residence, etc.) there were 399 complete cases. The number of complete student data records (complete data on background and goal scores) was only 323 or 49 per cent of the obtained sample of 654. Using only cases with complete data would have resulted in a quite unrepresentative residual sample.

Statistical Procedures Used

Tests utilized in Chapter III for determining whether the longitudinal group means and variances departed significantly from those of the norm group are given below. The norm group was the population from which the longitudinal group was derived. A z test was conducted (Hays, 1963, p. 250) to determine whether the observed longitudinal means were significantly different from the population mean (norm group) as follows:

(1) $$z = \frac{\bar{X} - \mu}{\sigma_m}$$

Where $\bar{X}$ = longitudinal group mean

μ = population (norm group) mean

σ_m = standard error of mean $\sigma/\sqrt{n}$

σ = population standard deviation

n = size of sample (number of cases on which a particular longitudinal group mean is based)

Testing the significance of differences between the variances of the respective groups was accomplished by computing a χ^2 and converting to a z (Hays, 1963, p. 344).

(2) $$\chi^2 = \frac{(n - 1)\, s^2}{\sigma^2}$$

Where n = size of sample (number of cases on which a particular longitudinal group variance is based)

$$s^2 = \Sigma(X_i - \bar{X})^2/(n-1)$$

(3) $$z = \sqrt{2\chi^2} - \sqrt{2df - 1}$$

σ^2 = population variance

$df = n - 1$

In Chapter IV which describes the results for the total longitudinal sample, correlation matrices are presented for grades 5 and 7 separately and the factor structure examined for each level. In addition, means and standard deviations are presented at each grade level together with dependent t-tests for evaluating differences between grade 5-7 means and variances. The computational formula for contrasting dependent means is (Guilford, 1965, p. 177):

(4) $$t = \frac{\bar{X}_7 - \bar{X}_5}{\sqrt{s^2_{m_5} + s^2_{m_7} - 2r_{57}s_{m_5}s_{m_7}}}$$

The formula for contrasting dependent variances is (Cuilford, 1965, p. 193):

(5) $$t = \frac{s_7^2 - s_5^2\sqrt{n - 2}}{2s_5s_7\sqrt{1 - r_{57}^2}}$$

In formulas (4) and (5) the subscripts refer to grade level and:

$\bar{X}_i$ = mean

s^2_m = variance error of mean s^2/n

s_m = standard error of mean = $\sqrt{s^2_m}$

r_{57} = Pearson r between scores at the two points in time

s^2 = estimated variance = $\Sigma(X_i - \bar{X}^2) / (n - 1)$

s = estimated standard deviation = $\sqrt{s^2}$

n = number of paired observations

Chapters V, VI, VII and VIII involve analyses for various subgroups. The analyses described for the total sample are repeated in the remaining chapters except for the correlation matrices and factor analyses. In addition, tests were carried out to determine whether across time correlations differ from subgroup to subgroup. Toward this end Fisher's z transformation was employed (Hays, 1965, p. 532):

(6) $$z = \frac{z_{r_a} - z_{r_b}}{\sqrt{\frac{1}{n_a - 3} + \frac{1}{n_b - 3}}}$$ where z_r = transformed r

n = number of observations

a, b = subscripts denoting subgroups

For the case where more than two groups are to be compared, the formula becomes,

(7) $$\chi^2 = \Sigma(n_j - 3)(z_{r_j} - U) \qquad \text{where } U = \frac{\Sigma(n_j - 3) z_{r_j}}{\Sigma(n_j - 3)}$$

and df = j-1

Tests were also conducted for comparing the subgroups with respect to means and variances of each goal area. The variances were tested via Hartley's F-max (Kirk, 1968, p. 62):

(8) $$F = \frac{s_1^2}{s_s^2}$$ where s_1^2 = largest variance

s_s^2 = smallest variance

In order to test for significant differences among means the Welch procedure was chosen. This method has been found to be robust when variances are heterogeneous and n's unequal (Kohr, 1970; Scheffé, 1970; Wang, 1971). This procedure, described in Winer (1962, p. 37) and Kirk (1968, p. 98), appeared to be the method of choice since none of the subgroups had equal numbers of observations. The technique involves the computation of a ratio labeled as t' in this report and an adjustment to degrees of freedom, labeled as df'.

$$(9) \qquad t' = \frac{\bar{X}_a - \bar{X}_b}{\sqrt{s_a^2 / n_a + s_b^2 / n_b}}$$

$$(10) \qquad df' = \frac{(df_a)\ (df_b)}{df_2 C^2 + df_1\ (1 - C)^2} \qquad \text{where } C = \frac{s_a^2 / n_a}{s_a^2 / n_a + s_b^2 / n_b}$$

The very large volume of significance tests performed makes the likelihood very great that certain significant results will be obtained by chance alone. Ideally, multivariate statistical methods should be applied in which protection against Type I errors (falsely rejecting the null hypothesis) is extended across the entire set of variables. This was not feasible in the present circumstances because multivariate programs readily available do not accept incomplete data sets.

A difficulty in interpreting differences when they are found to be statistically significant lies in the judgment as to their substantive significance. The question of how big a differential (in observed score units) makes a practical difference is not easy to answer. Attention needs to be directed to this problem because small, trivial differences can easily be found significant when n is large. Further, the probability level at which an observed difference is found significant is not an index of its importance. Guidelines

which may be applied in a determination of importance have been worked out by Cohen (1969). His concept of "effect size" is most relevant for present purposes. When means are to be contrasted, Cohen defines effect size (d) in terms of standard units, i.e., the size of the difference relative to the common standard deviation (p. 18):

$$(11) \qquad d = \frac{\left|\bar{X}_a - \bar{X}_b\right|}{\sigma}$$

where $\bar{X}_a$ and $\bar{X}_b$ are group means

σ = common population standard deviation

In the examination of longitudinal and norm group means (Chapter III) the effect size may be represented as (p. 43):

$$(12) \qquad d = \frac{\left|\bar{X}_1 - \mu\right|}{\sigma}$$

where $\bar{X}_1$ = longitudinal mean

μ = population mean (norm group)

σ = population standard deviation

An effect size determination may also be constructed for the case of correlated means, as when the means at grades 5 and 7 are to be contrasted. Effect size d for this case may be computed as follows (p. 46):

$$(13) \qquad d = \frac{\left|\bar{X}_7 - \bar{X}_5\right|}{s_z}$$

where $\bar{X}_7$ and $\bar{X}_5$ are the grade 7 and 5 means

$$s_z = \sqrt{s_5^2 + s_7^2 - 2r_{57}s_5s_7}$$

s^2, s, and r are as defined under (5)

A related but somewhat different concept of effect size is employed when subgroup means are contrasted as in Chapters V, VI, etc. Effect size may be thought of in terms of correlation and proportion of variance accounted for. When two groups are compared (e.g., male-female), membership in a group may be

scored dichotomously (e.g., 1=male, 2=female). A Pearson r may be computed between group membership and the variable of interest (i.e., goal scores). In this special case, where a dichotomous variable (X) is correlated with a continuous variable (Y), the term point biserial r is often applied. The square of this correlation yields the proportion of Y variance accounted for by the X variable (and vice versa). Cohen (p. 20) presents a table of equivalents for effect size, as d, and other indices including r and r^2. A small effect is defined as a d of .2, the equivalent r and r^2 values being .10 and .01. A medium sized effect is considered to be a d of .5 with an equivalent r and r^2 of .24 and .06. A large effect is regarded as a d of .8 with corresponding r and r^2 values of .37 and .14.

CHAPTER III

THE SAMPLE

As indicated in Chapter I, 355 elementary schools comprised the sample of schools deemed representative of the state during the 1969 norming operation (Phase II). During the spring of 1971 a subset of these schools was selected for participation in the longitudinal study. The general plan called for pupils who had been tested in 5th grade (October 1969) to be retested with the same battery in October 1971 thereby yielding data across a two year span. To accomplish this task, schools housing these pupils when they were 5th graders had to be contacted in order to ascertain which junior high schools were recipients of their "graduates."

Concomitant with the development of plans for the conduct of the longitudinal study was the establishment of plans for the October 1971 field testing (Phase I) of the prospective 7th grade assessment package. Various factors including budget constraints posed limits on how many pupils could be tested. This meant that the total number of pupils, longitudinal and Phase I together, could not exceed a certain number. Changes were made in the plans for the two operations at various stages of development. Consequently, the method of selecting the subset of schools which ultimately participated in the longitudinal study is somewhat difficult to describe.

Sample Selection Procedures

Initially, the 355 Phase II elementary schools were rank ordered with respect to an index of socioeconomic status (Reiss, Hatt and North, 1961). A systematic sample of 50 schools was then selected by taking every seventh school. Following this was a decision to involve fewer schools in the

longitudinal study in order to permit a greater number of students to be a part of the 7th grade, Phase I field testing. Twenty schools were then selected from the previous 50 by taking alternately, every second, then every third school, e.g., 2, 5, 7, 10, 12, 15, . . .,50.

Administrators of these 20 schools were asked to identify the junior high schools receiving pupils from their elementary schools. A printout listing the names of the pupils associated with a particular Phase II elementary school was then sent to the administrator of the appropriate junior high school(s). Administrative staff were requested to cross off the names of those children whom they did not have currently enrolled.

Those pupils who were enrolled became candidates for selection into the longitudinal group with one important exception. In cases where two or more junior high schools were recipients of pupils from a given elementary school, only the junior high receiving the largest proportion was permitted to participate. About half of the elementary schools supplied two or more secondary schools. The major recipient school received at least 80 per cent of the children from a given elementary school. This circumstance can be a source of bias if systematic differences exist between the up to 20 per cent who filtered into other schools and those entering the main recipient school. Unfortunately, procedures were never established to determine the amount of potential bias at precise time the "candidate pool" was being developed. Currently, there is no easily available information to bring to bear on the problem. Thirty-five 7th grade pupils were randomly selected via a random numbers table from the candidate pool within each of the 20 junior high schools. To be tested then, were 700 pupils. Of these, 46 were either no longer enrolled or were absent on the day of testing and were lost to the sample. Hence, the final longitudinal sample consisted of 654 cases.

Missing Data and Scoring Adjustments

Unfortunately, steps were not taken to interrogate the student records from the grade 5 data tape for completeness prior to sample selection. As a result the grade 5 information has a considerable sprinkling of missing data. Part of the information loss was due to the original scanning of the grade 5 answer forms. Specifically the problem centers on answers to a question concerning the pupil's area of residence (i.e., open country, small town, medium sized city, etc.) which has 8 categories. The proper coded value for five of these categories was properly transmitted to the tape; however, the other three were transmitted as zeros, ordinarily indicative of an omit. Consequently, the incidence of non-response for the variable RESIDENCE is very much inflated.

Missing data are also a problem in the goal areas. The N column for the longitudinal sample in Table 2 reveals how many "valid records" there were in the grade 5 data. Subtracting the Np column in Table 7 from these figures yields the number of "invalid records" occurring for each goal area at grade 7. A valid record for goal area is defined in terms of the percentage of items attempted. Specifically, a valid student record is one in which at least 80 per cent of the items have been responded to. An invalid record is one having an insufficient number of responses to be scored, i.e., less than 80 per cent attempted.

Exceptions to this rule occur for Goals III and VI which are achievement tests and are scored according to the number correct. In the case of the other goals, which are composed of attitude scales, the failure to respond to several items can result in a spuriously low score. For those cases having omits, but meeting the criteria of a valid record, the following formula was applied which serves to estimate the pupil's total goal score had he answered every item:

$$T = \frac{S \times K}{I}$$

Where T = estimated total score
S = sum of items responded to
K = number of items on the scales
I = number of items responded to

Representativeness of Sample

The problem of representativeness is inherent in any longitudinal study. Of particular concern is the problem of subject loss. In the present study the problem is compounded by the procedures used in obtaining the sample. There are, of course, multiple sources of contamination. If one is willing to assume that the approximately 20,000 children who were tested in 1969 during Phase II form a representative sample of Pennsylvania 5th graders, the problem is somewhat reduced. The problem becomes a question of how representative of the norm sample is the resultant longitudinal sample.

In order to estimate the comparability of the longitudinal and the 1969 norm sample, descriptive indices were developed on relevant background variables for which data were available. These figures are presented in Table 1. The percentage of cases falling into various subgroups is similar for the longitudinal and norm samples with no gross deviations. Indeed, there seems to be sufficient comparability to warrant the conclusion that the longitudinal group is representative of the norm sample. It should be re-emphasized that the high incidence of non-response for the variable RESIDENCE is largely inflated as a result of an error in production of the Phase II data tapes. For example, all the children attending school in inner city Philadelphia should have an appropriate RESIDENCE code. Instead, they are incorrectly represented by a zero. In the author's opinion, the incidence of true non-response for this variable is ordinarily quite low and the non-responders in the norm and longitudinal samples are found predominately in urban areas.

TABLE 1

Comparability of Longitudinal Sample with 1969 Norm Sample in Terms of Background Characteristics

Variable	Longitudinal Sample (N=654)	Norm Sample (N≈20,000)
1. SEX		
Male	48.6%	49.3%
Female	51.2	47.2
Non-Response	0.2	3.5
2. INTER-RACIAL MIXTURE		
Yes	42.8	41.6
No	52.0	54.4
Non-Response	5.2	5.0
3. RESIDENCE		
Open country	26.3	29.8
Small town	25.5	28.1
Medium city	10.4	10.1
Suburg medium city	8.1	8.1
Large city	4.4	3.4
Non-Response[1]	25.2	20.5
4. RACE		
Black	6.4	6.4
White	88.1	82.7
Amer. Indian	1.8	2.4
Oriental	0.2	0.7
Puerto Rican	0.5	0.4
Other	0.1	0.0
Non-Response	2.9	7.4

5. EDUCATIONAL LEVEL OF PARENTS

	Fathers	Mothers	Fathers	Mothers
Some grade school	1.7%	0.8%	1.8%	1.1%
Completed grade school	4.4	3.4	7.2	5.0
Some high school	21.7	20.0	21.1	21.3
High school graduate	30.1	40.7	34.7	44.4
Some advanced education	9.5	9.5	8.5	8.2
Bachelor's degree	7.3	4.0	6.7	4.5
Masters degree	1.2	0.2	1.5	0.4
Masters degree plus	0.9	0.0	0.5	0.1
Doctorate	0.6	0.0	1.3	0.4
Non-Response	22.5	21.6	16.7	14.7

[1]Inflated by error in production of Phase II data tapes.

The high incidence of non-response in the EDUCATIONAL LEVEL variable likely comes from not knowing or not wishing to reveal the information.

Comparability may also be examined by contrasting the groups with respect to means and standard deviations of each goal area. Regarding the norm group as the population and the longitudinal group as a sample from that population, one may apply statistical tests to determine whether significant departures exist. Summarized in Table 2 are the means and standard deviations for the longitudinal and norm groups.

A z test (see Chapter II for details) was used to determine whether the longitudinal grade 5 means differed significantly from those of the norm group. All tests were non-significant with the exception of Goal IV ($z = 2.84$, $p < .01$), Goal V ($z = 2.76$, $p < .01$), and Goal VII ($z = 2.78$, $p < .01$). To assist in evaluating these significant differences one can examine the "effect size" by forming a ratio of the observed difference to the population standard deviation (Cohen, 1969). For these three goals the observed differences are all .11 of a standard deviation. In each case the effect size is quite small (only about one-tenth of a standard deviation) and can be safely disregarded.

In order to determine whether the longitudinal group variances departed significantly from the norm group, a χ^2 was computed and converted to a z (see Chapter II for details). None of these tests revealed statistically significant differences.

Summary

With regard to the statistical results, the longitudinal group, in general, appears to be fairly representative of the norm group from which it was derived. A slight positive bias in favor of the longitudinal group was observed for the means of three goal areas. When considering the substantive significance of these deviations, it was concluded that they were trivial and

TABLE 2

Comparability of Longitudinal Sample with 1969 Norm Sample

In Terms of Total Goal Scores

	Longitudinal Sample (1969 data)			Norm Sample (1969)		
Goal	N	Mean	SD	N	Mean	SD
I	636	87.59	8.08	19435	87.02	8.09
II	641	32.86	5.41	19405	32.48	5.34
III-V	638	15.94	5.26	19618	15.99	5.36
III-M	642	17.41	4.49	19738	17.59	4.50
IV	632	59.82	9.29	19444	58.82	8.85
V	628	163.16	22.01	19372	160.83	21.01
VI	617	28.73	6.75	19301	28.22	6.51
VII	630	139.90	16.28	19465	138.16	15.53
VIII	629	60.04	5.22	19487	59.90	5.15
IX	641	52.04	5.36	19456	51.84	5.49
X	634	102.33	16.03	19414	100.99	16.07

could reasonably be disregarded. There is, of course, the possibility that the sample does depart from the norm group in other important but unmeasured ways.

CHAPTER IV

RESULTS FOR TOTAL SAMPLE

Relationships Among Goals

Summarized in Tables 3 and 4 are the inter-goal correlations at grades 5 and 7. Due to missing data the number of observations (n) for each r is somewhat different. The n's range from 597 to 637 at grade 5 with a median n of 620. At grade 7 the range is from 603 to 636 with a median n of 621. There is a slight tendency for the r's to be higher at grade 7 (42 of the 55 r's showed a slight but generally trivial increase). It may be that pupil growth in reading ability is responsible for the observed increase. In general, the pattern of r's appears quite similar for the two grade levels.

In order to get a further indication of the comparability of the two correlation matrices, the factor structure was examined. Toward this end, the correlation matrix at each grade level was subjected to a principal components analysis followed by varimax rotation. The three factor solution for each grade level appeared to be the most interpretable. Tables 5 and 6 contain the rotated factor loadings for grades 5 and 7. The first three factors account for about 57 per cent of the variance at grade 5 and about 62 per cent at grade 7. The contribution of each factor to total variance is similar at each grade level. An examination of the loadings for each goal reveals essentially the same pattern at both grade levels. Goal I appears to be factorially complex, judging from the moderate size of the loadings across factors. Goal II has rather moderate loadings on factors I and II. Goals III-V and III-M are clearly identified with factor I and Goal IV with factor II. Goal V loads on the first two factors at grade 5 but shows a trend toward

Table 3

Correlations Between Goal Areas at Grade 5

for Total Longitudinal Sample (N=654)

Goal	I	II	III-V	III-M	IV	V	VI	VII	VIII	IX
II	.14									
III-V	.27	.21								
III-M	.20	.14	.61							
IV	.27	.24	.19	.13						
V	.32	.29	.43	.34	.50					
VI	.29	.28	.59	.49	.20	.50				
VII	.34	.28	.39	.32	.38	.57	.46			
VIII	.37	.16	.42	.27	.11	.30	.38	.34		
IX	.15	.11	.08	.05	.34	.29	.06	.26	.04	
X	.03	.07	.03	.04	.08	.05	.07	.05	-.08	.20

Table 4

Correlations Between Goal Areas at Grade 7

for Total Longitudinal Sample (N=654)

Goal	I	II	III-V	III-M	IV	V	VI	VII	VIII	IX
II	.22									
III-V	.28	.25								
III-M	.23	.17	.66							
IV	.30	.27	.10	.08						
V	.40	.33	.32	.33	.54					
VI	.30	.32	.60	.52	.20	.53				
VII	.34	.33	.27	.26	.52	.65	.42			
VIII	.42	.27	.51	.40	.18	.40	.49	.37		
IX	.23	.22	.09	.09	.48	.46	.22	.45	.22	
X	.00	.10	-.01	.01	.13	.06	.04	.17	-.08	.21

Table 5

Matrix of Rotated Factor Loadings at Grade 5

	Factor			
Goal	I	II	III	h^2
I	.25	.48	.35	.41
II	.24	.40	-.04	.22
III-V	.84	.15	.05	.73
III-M	.80	.04	-.08	.65
IV	.01	.79	.00	.62
V	.41	.69	.07	.65
VI	.78	.25	.04	.66
VII	.42	.62	.12	.58
VIII	.50	.22	.46	.51
IX	-.10	.66	-.32	.55
X	.13	.14	-.82	.72
Sum of Squared Loadings	2.69	2.45	1.16	
Per cent of Trace	24.45	22.27	10.55	

Table 6

Matrix of Rotated Factor Loadings at Grade 7

	Factor			
Goal	I	II	III	h^2
I	.29	.48	.38	.46
II	.30	.42	-.10	.28
III-V	.88	.06	.02	.78
III-M	.83	.03	-.04	.69
IV	-.04	.81	.00	.66
V	.35	.75	.09	.70
VI	.76	.31	-.00	.67
VII	.28	.76	-.06	.65
VIII	.62	.31	.32	.59
IX	.01	.73	-.17	.57
X	.03	.20	-.89	.83
Sum of Squared Loadings	2.80	2.98	1.09	
Per cent of Trace	25.45	27.12	9.88	

a stronger identification with factor II at grade 7. Goal VI demonstrates a high loading on factor I and a fairly low loading on factor II. At Goal VII moderate loadings may be observed on the first two factors; however, at grade 7 factor II emerges as the more salient. At grade 5 Goal VIII has very similar loadings on factors I and III but at grade 7 the picture becomes one in which factor I contains the strongest loading with somewhat weaker loadings on factors II and III. Goal IX became more strongly identified with factor II by grade 7 and Goal X displayed strong identification with factor III at both grade levels. In summary, Goals III-V, III-M, IV and X displayed great similarity in the sense that very high loadings were found on a particular factor and quite negligible loadings on the other two factors. There was very little difference in these loadings at the two grade levels. Goal VI also showed great stability although the next highest loading was in a borderline zone as far as size is concerned. Goals I and II remained factorially complex in about the same degree. Goals V, VII, VIII and IX demonstrated an increase in factorial identification from grade 5 to grade 7. This was evidenced by an increased loading on the factor having the higher loading at grade 5 and a decrease in the next highest loading.

Across Time Correlations

The correlations between grade 5 and grade 7 scores at each goal are termed across time correlations in this report. They indicate the degree of stability over a two year span. As one might expect the greatest stability was shown for the cognitive areas, Goals III-V, III-M and VI. Moderate stability was exhibited for Goals I, V, VII and VIII. Rather weak correlations were observed for Goals II, IV, IX and X. All of the correlations are statistically greater than zero by virtue of the sample size. Therefore, in

Summary of Across Time Correlations, Means, Dependent t for Difference Between Means, Standard Deviations, and Dependent t for Difference Between Variances for Longitudinal Sample (N=654)

Goal	Np	r	Grade 5 Mean	Grade 7 Mean	t	Grade 5 SD	Grade 7 SD	t
I	616	.52	87.73	88.86	3.50[b]	8.07	8.30	0.78
II	623	.22	32.90	34.43	6.12[b]	5.37	4.61	-3.91[b]
III-V	615	.66	16.01	21.34	30.59[b]	5.26	5.27	0.04
III-M	620	.67	17.50	21.97	30.23[b]	4.48	4.60	0.91
IV	607	.35	59.95	57.75	-5.05[b]	9.29	9.49	0.56
V	608	.48	163.31	163.74	0.46	22.06	22.83	0.96
VI	600	.58	28.87	32.99	16.68[b]	6.70	6.48	-0.99
VII	615	.48	140.08	142.08	3.08[a]	16.32	15.16	-2.07
VIII	613	.47	60.05	63.77	16.22[b]	5.25	5.76	2.58
IX	619	.33	52.08	51.11	-3.54[b]	5.32	6.39	4.87[b]
X	606	.29	102.50	106.27	5.07[b]	15.86	14.84	-1.71

a = obtained difference significant at .01 level.
b = obtained difference significant at .001 level.
Np = number of paired observations

evaluating the importance of the across time relationships, attention should be focused on the amount of variance accounted for.

Shifts in Means from Grade 5 to 7

Statistically significant changes occurred in all goal areas except V (citizenship). In two instances there was a decrement, in all other areas the means increased. To help evaluate the practical importance of these shifts, Cohen's d index is employed. Table 8 summarizes the d values for each goal area.

Table 8

Substantive Significance of Grade 5-7 Mean Shifts

	Goal Area									
	I	II	III-V	III-M	IV	V	VI	VII	VIII	IX	X
d value	.14	.25	1.23	1.22	.20	.02	.68	.12	.66	.14	.21

Goals IV (interest in school) and IX (appreciating human accomplishments) displayed a downward shift in the group means. This would suggest that a decline in pupil's interest in school takes place between grades 5 and 7. Likewise students would seem to view various human accomplishments in less esteem. The diminished interest in school is not unexpected; however, the decrease is only about two-tenths of a standard deviation which Cohen regards as a lower limit for a small effect. Although the shift is relatively small, its importance lies in whether this trend continues for each school year. This, of course, cannot be known from the data here, but something which further longitudinal investigations may reveal. However, the present finding is consistent with those obtained by two cross-sectional investigations. In a study involving grades 6, 7, 8 and 9 Yamamoto, Thomas and Karns (1969) found

that ratings of teachers and overall curriculum became progressively more negative across grade levels. These authors note that their results are consistent with those obtained by Neal and Proshek (1967) in a study of culturally advantaged and disadvantaged elementary school children. The decrease in appreciating human accomplishments is only .14 of a standard deviation and can hardly be considered as an important change. The failure of this goal area to show an increase may be related to a developing differentiation of interests at this age range. At grade 5 there may be more of a generalized tendency to enjoy witnessing various types of performances. By grade 7 children's likes and dislikes may be more developed such that an increase in overall score not observed. In other words, important and interesting changes may be occurring between grades 5 and 7 but they are not reflected in a change in overall means. It is interesting to note that a statistically significant, although small, increase in variability occurred. This finding is consistent with the notion of a greater differentiation of attitudes toward various human accomplishments.

The increases found for Goals III-V and III-M were of major proportion, nearly one and a quarter standard deviations. This should be expected since the instruments deal with verbal analogies and mathematics. A failure to exhibit an increase in these areas would be most remarkable indeed.

Sizable gains were also observed for Goal VI (health) and Goal VIII (vocational development). Here again, substantial gains are expected. The Goal VI instrument is essentially a measure of health knowledge. The Goal VIII instrument is a measure of vocational maturity and its development leaned heavily on the items demonstrating growth over time. Hence, there would appear to be an increased maturity in vocational attitudes in the longitudinal sample.

Gains of a small effect size were observed at Goals II (attitude toward differing others) and Goal X (preparing for a changing world). This would suggest that a more positive attitude toward persons who differ in significant ways is being developed. Likewise some improvement in attitudes deemed important in coping with life changes seems to be taking place.

Although the increase is statistically significant at Goal I (self concept) and Goal VII (creative attitude), the changes are only .14 and .12 of a standard deviation.

Shifts in Variability from Grade 5 to 7

Only two significant changes in variability occurred. A significant decrease was observed at Goal II. This may indicate a trend toward greater homogeneity in attitudes toward differing others. Another possibility is that a ceiling effect is depressing the variability. A significant increase in variability was found for Goal IX and was discussed above.

CHAPTER V

MALE-FEMALE DIFFERENCES

The statistical summary for males and females is presented in Tables 9 and 10, respectively. The results of various aspects of the analysis are described below.

Across Time Correlations

The pattern of across time correlations for the male and female groups is highly similar to each other and to the total group. Each across time correlation for the male group was statistically compared (see Chapter II for details) with the respective correlation in the female group. None of these comparisons revealed a significant difference between correlations.

Shifts in Means from Grade 5 to 7

The males displayed statistically significant gains in six goal areas; in Goals V and VII the differences were non-significant. In Goals IV and IX a significant decrement took place.

Females, likewise, exhibited a significant decrement in Goal IV and showed no significant change in Goal V. They were also like the males in exhibiting significant gains in Goals II, III-V, III-M, VI, VIII and X. In contrast, the female group showed a significant gain in Goal VII, but no significant differences in Goals I and IX.

The substantive significance of these shifts, in terms of Cohen's d index, is displayed in Table 11 below.

Table 9

Summary of Across Time Correlations, Means, Dependent t for Difference Between Means, Standard Deviations, and Dependent t for Difference Between Variances for Males (N=318)

Goal	Np	r	Grade 5 Mean	Grade 7 Mean	t	Grade 5 SD	Grade 7 SD	t
I	293	.51	87.60	88.89	2.77[a]	7.91	8.20	0.70
II	298	.19	32.85	34.24	3.52[b]	5.62	5.08	-1.76
III-V	294	.65	15.91	21.32	21.44[b]	5.21	5.17	-0.16
III-M	297	.67	17.97	22.41	20.70[b]	4.53	4.55	0 11
IV	295	.29	58.83	56.08	-4.13[b]	9.04	10.15	2.08
V	295	.45	159.75	158.94	-0.56	23.42	23.93	0.42
VI	292	.52	28.23	32.02	9.53[b]	6.99	6.94	-0.17
VII	299	.46	138.78	139.49	0.73	16.59	15.78	-0.97
VIII	299	.42	59.89	63.25	10.46[b]	4.89	5.40	1.90
IX	299	.36	51.31	49.69	-4.09[b]	5.59	6.53	2.90[a]
X	290	.28	103.27	106.94	3.42[b]	15.31	15.13	-0.22

a = obtained difference significant at .01 level.
b = obtained difference significant at .001 level.
Np = number of paired observations.

Table 10

Summary of Across Time Correlations, Means, Dependent t for Difference Between Means, Standard Deviations, and Dependent t for Difference Between Variances for Females (N=335)

Goal	Np	r	Grade 5 Mean	Grade 7 Mean	t	Grade 5 SD	Grade 7 SD	t
I	322	.52	87.83	88.80	2.13	8.24	8.38	0.36
II	324	.27	32.96	34.60	5.21[b]	5.15	4.13	-4.12[b]
III-V	320	.67	16.13	21.39	21.88[b]	5.31	5.32	0.05
III-M	322	.67	17.08	21.62	22.32[b]	4.38	4.53	0.80
IV	312	.38	61.00	59.32	-2.96[a]	9.42	8.55	-1.85
V	313	.47	166.67	168.27	1.34	20.16	20.78	0.60
VI	308	.64	29.47	33.91	14.87[b]	6.36	5.88	-1.76
VII	316	.49	141.31	144.53	3.74[b]	15.99	14.15	-2.49
VIII	314	.51	60.21	64.26	12.45[b]	5.58	6.05	1.64
IX	319	.26	52.78	52.41	-0.98	4.95	5.95	3.41[b]
X	315	.30	101.81	105.55	3.63[b]	16.37	14.47	-2.30

a = obtained difference significant at .01 level.
b = obtained difference significant at .001 level.
Np = number of paired observations.

Table 11

Substantive Significance of Grade 5-7 Mean Shifts

at each Goal Area for Male-Female Groups

	Goal Area										
Group	I	II	III-V	III-M	IV	V	VI	VII	VIII	IX	X
Male	.16	.20	1.25	1.20	.24	.03	.56	.03	.60	.24	.20
Female	.12	.29	1.22	1.24	.17	.08	.85	.21	.70	.06	.20

A gain magnitude in excess of a standard deviation was obtained for Goal III. Rather sizeable gains also occurred for both sexes in Goals VI and VIII. The effect size for statistically significant changes in Goals II, IV (males), VII (females), IX (males) and X was in the small range ($.20 \leq d \leq .29$).

Differences in Mean Goal Scores for Males and Females

The means for the male-female groups were also contrasted across each goal/grade area. The results of these tests are summarized in Table 12. The means and standard deviations are not shown since they are displayed in Tables 9 and 10. A negative t' reflects a higher female mean on the variable in question. The table also contains the correlation (r) between group membership and each particular goal score and (r^2) the proportion of variance accounted for (see Chapter II for details). Most of the comparisons are not statistically significant. None of the significant differences reached a moderate effect size, i.e. an $r = .24$, $r^2 = .06$ which is approximately comparable to $d = .5$.

In Goal IV males exhibited lower means (indicative of a lower interest in school) than females at both grade levels. These differences, while statistically significant, are relatively weak as shown by r values of -.12 and -.17 which are approximately equivalent to d values of .2 and .3.

Table 12

Summary of Male-Female Mean Contrasts

Goal	Grade	t'	df'	r	r^2
I	5	-0.36	611	-.01	.00
I	7	0.14	610	.01	.00
II	5	-0.26	602	-.01	.00
II	7	-0.98	573	-.04	.00
III-V	5	-0.54	609	-.02	.00
III-V	7	-0.16	610	-.01	.00
III-M	5	2.50a	609	.10	.01
III-M	7	2.19	612	.09	.01
IV	5	-2.91b	605	-.12	.01
IV	7	-4.25b	576	-.17	.03
V	5	-3.90b	581	-.16	.03
V	7	-5.12b	583	-.20	.04
VI	5	-2.28	585	-.09	.01
VI	7	-3.59b	571	-.15	.02
VII	5	-1.93	608	-.08	.01
VII	7	-4.17b	597	-.17	.03
VIII	5	-0.76	607	-.03	.00
VIII	7	-2.19	608	-.09	.01
IX	5	-3.45b	596	-.14	.02
IX	7	-5.42b	601	-.21	.05
X	5	1.13	603	.05	.00
X	7	1.15	593	.05	.00

a = obtained difference significant at .01 level
b = obtained difference significant at .001 level

Males displayed significantly lower means in Goal V (citizenship) at both grade levels. The r values of -.16 and -.20 convert to d values of approximately .3 and .4 points which are somewhat between Cohen's guidelines for small and moderate effects.

Females also displayed significantly higher means at both grade levels in Goal IX (appreciating human accomplishments). The r values of -.14 and -.21 are approximately equivalent to d values of .3 and .4. Again the differences can be regarded only as slight.

For Goals VI (health) and VII (creativity) the differences are non-significant at grade 5, but significant at grade 7. This type of finding is suggestive of an ordinal interaction (Lubin, 1962). An examination of the Goal VI means, however, reveals an increase for both males and females; but the magnitude of the increase could hardly be regarded as sizeably higher for the female group. Something more akin to a meaningful interaction may be observed for Goal VII. Here, the females displayed a significant, although slight, increase. The males failed to demonstrate a significant gain. Since the male-female means were not statistically different at grade 5 but do diverge significantly at grade 7, it may be concluded that the female group did show a small gain, whereas the males did not.

Shifts in Variances from Grade 5 to 7

As may be seen from Table 9 only one statistically significant change in variability occurred for the males. For Goal IX a significant increase was found although the magnitude of the differences does not appear to be very great. Similarly, the females displayed a significant increase at Goal IX. Additionally, the females revealed a significant decrease in variability for Goal II.

Differences in Variability for Males and Females

Six of the 22 comparisons were found to be statistically significant at the .01 level. In five cases, the males exhibited greater variability although the variance ratios were not great, the largest being 1.51. These occurred for the following goal-grade areas: II-7, IV-7, V-5, V-7 and VI-7. The female group exhibited greater variability at VIII-5, although the difference was not great.

CHAPTER VI

DIFFERENCES BETWEEN INDIVIDUALS HAVING AND NOT HAVING INTERRACIAL EXPOSURE

The statistical summary for those individuals claiming interracial exposure is presented in Table 13. Table 14 contains the statistical summary for those individuals not claiming to experience exposure to persons of another race. For ease of communication, the two groups will hereafter be referred to as "exposure" and "non-exposure," respectively.

Across Time Correlations

The pattern of across time correlations for the two groups is very similar. Each across time correlation for the exposure group was statistically contrasted with the respective correlation in the non-exposure group. None of these companions revealed statistically significant differences. A significance level of .01 was employed for all tests.

Shifts in Means from Grade 5 to 7

Both the exposure and non-exposure groups demonstrated statistically significant increases in Goals II, III-V, III-M, VI, VIII and X. Both groups also revealed a significant decrement in Goal IV. In addition, the exposure group showed a significant increment in Goal VII and the non-exposure group a significant decrement in Goal IX.

In order to evaluate the statistically significant shifts in terms of their practical significance, Cohen's d index was computed. These values are displayed for both groups in Table 15 below.

Table 13

Summary of Across Time Correlations, Means, Dependent t for Difference Between Means, Standard Deviations, and Dependent t for Difference Between Variances for Students Claiming to Have Interracial Exposure (N=280)

Goal	Np	r	Grade 5 Mean	Grade 7 Mean	t	Grade 5 SD	Grade 7 SD	t
I	262	.48	87.89	88.92	2.08	8.07	7.68	-0.89
II	265	.16	32.88	34.59	4.48[b]	5.01	4.53	-1.68
III-V	263	.66	15.34	20.75	20.41[b]	5.00	5.37	1.53
III-M	266	.66	16.75	21.31	20.38[b]	4.29	4.53	1.14
IV	262	.40	60.18	58.19	-2.97[a]	10.00	9.79	-0.38
V	264	.47	162.64	163.64	0.68	22.92	23.46	0.43
VI	262	.54	28.52	32.70	10.64[b]	6.65	6.57	-0.22
VII	262	.56	139.50	142.59	3.29[a]	16.64	15.61	-1.24
VIII	263	.50	60.18	63.36	9.14[b]	5.21	6.03	2.75[a]
IX	262	.39	52.36	51.61	-1.83	5.61	6.34	2.13
X	258	.23	102.61	106.15	2.95[a]	16.20	14.72	-1.57

a = obtained difference significant at .01 level.
b = obtained difference significant at .001 level.
Np = number of paired observations.

Table 14

Summary of Across Time Correlations, Means, Dependent t for Difference Between Means, Standard Deviations, and Dependent t for Difference Between Variances for Students Claiming No Interracial Exposure (N=340)

Goal	Np	r	Grade 5 Mean	Grade 7 Mean	t	Grade 5 SD	Grade 7 SD	t
I	328	.53	87.64	88.58	2.09	8.06	8.76	1.75
II	330	.25	32.87	34.42	4.51[b]	5.59	4.47	-4.24[b]
III-V	325	.66	16.76	22.11	22.59[b]	5.34	4.92	-1.95
III-M	327	.64	18.34	22.73	21.28[b]	4.41	4.43	0.08
IV	331	.31	59.78	57.54	-3.81[b]	8.77	9.30	1.13
V	334	.47	164.33	164.32	-0.01	21.05	22.20	1.10
VI	313	.62	29.50	33.45	12.54[b]	6.45	6.31	-0.46
VII	332	.43	140.94	142.10	1.29	16.03	14.73	-1.71
VIII	332	.44	60.09	64.29	13.45[b]	5.23	5.50	1.01
IX	329	.26	51.94	50.72	-3.13[a]	5.14	6.35	4.00[b]
X	322	.35	102.54	106.12	3.64[b]	15.82	15.07	-0.93

a = obtained difference significant at .01 level.
b = obtained difference significant at .001 level.
Np = number of paired observations.

Table 15

Substantive Significance of Grade Five-Seven Mean Shifts at each Goal Area for Exposure and Non Exposure Groups

	Goal Area										
Group	I	II	III-V	III-M	IV	V	VI	VII	VIII	IX	X
Exposure	.13	.27	1.26	1.25	.18	.04	.66	.20	.56	.11	.18
Non-Exposure	.12	.21	1.25	1.18	.21	.00	.71	.07	.74	.17	.20

For both groups major increases took place for Goals III-V, III-M, VI, and VIII. The observed increase at Goals II and VII for the exposure group reached Cohen's criterion for a small effect. The non-exposure group demonstrated a small effect increase for Goals II and X and decrease for Goal IV.

Differences in Mean Goal Scores for Exposure and Non-Exposure Groups

The means for the exposure and non-exposure groups were contrasted at each goal/grade area. The results of these significance tests are summarized in Table 16. Since the means and standard deviations are shown in Tables 13 and 14, they are not repeated. A negative t' reflects a higher non-exposure mean on that variable. The table also contains the correlation (r) between group membership and each goal score and the proportion of variance accounted for (r^2). The only statistically significant differences occurred at both grade levels for Goal III. Here, the r's range from -.13 to -.18 and are indicative of small effects (r's convert to d values of .2 to .3). The results indicate that the non-exposure group exhibited slightly higher verbal and math scores at both grade levels. In the predominantly attitudinal areas the two groups exhibited similar mean scores.

The lack of significant differences between the exposure and non-exposure groups should not lead to the conclusion that interracial mixture has little

Table 16

Summary of Contrasts Between Means of Exposure and Non-Exposure Groups

Goal	Grade	t'	df'	r	r^2
I	5	0.37	559	.02	.00
I	7	0.50	583	.02	.00
II	5	0.01	586	.00	.00
II	7	0.45	562	.02	.00
III-V	5	-3.32b	574	-.13	.02
III-V	7	-3.17b	538	-.13	.02
III-M	5	-4.43b	572	-.18	.03
III-M	7	-3.83b	561	-.16	.02
IV	5	0.51	522	.02	.00
IV	7	0.81	547	.03	.00
V	5	-0.93	541	-.04	.00
V	7	-0.36	550	-.01	.00
VI	5	-1.77	549	-.07	.00
VI	7	-1.38	547	-.06	.00
VII	5	-1.06	550	-.04	.00
VII	7	0.39	544	.02	.00
VIII	5	0.20	563	.01	.00
VIII	7	-1.95	537	-.08	.01
IX	5	0.94	536	.04	.00
IX	7	1.69	560	.07	.00
X	5	0.05	545	.00	.00
X	7	0.02	556	.00	.00

a = obtained difference significant at .01 level
b = obtained difference significant at .001 level

impact. Our measure of exposure is not without problems. In certain schools there is only a handful of non-whites; however, the students can claim to have interracial exposure since they are asked the broader question of interracial exposure in classes or school activities, the latter possible in a racially homogeneous student population. This circumstance is not at all like a situation in which there is a heavy concentration of non-whites. When children from these two different exposure situations are lumped together as a group because of their same replies they can easily appear much more like the non-exposure students who come from predominantly small towns having few if any non-white residents.

Shifts in Variances from Grade 5 to 7

The exposure group exhibited a statistically significant, although slight, increase in variability at Goal VIII. The non-exposure group displayed a significant increase in variability at Goal IX and a significant decrease at Goal II.

Differences in Variability for Exposure and Non-Exposure Groups

Only two of the 22 comparisons were found to be statistically significant at the .01 level. The incidence of significant differences approaches chance expectation. Furthermore, the largest variance ratio was only 1.3.

CHAPTER VII

DIFFERENCES AMONG LEVELS OF FATHER'S EDUCATION

Presented on the succeeding pages are the statistical summary tables for the following groups: students who fathers have not completed high school (Table 17), students whose fathers have completed high school (Table 18) and students whose fathers have received some amount of education beyond high school (Table 19). For ease of communication these three groups will be referred to as low, middle and high FEDUC.

Across Time Correlations

In general, the pattern of across time correlations for the three groups is similar. Each across time correlation for a particular group was statistically compared with the respective correlation in each of the other groups. The technique used in contrasting correlations for j groups is described in Chapter II. A significant departure was found for only one of the 10 goal areas. This occurred for Goal I ($\chi^2 = 7.98$, df = 2, $p < .05$). The low FEDUC group has a significantly lower correlation than the middle ($z = 2.55$, $p < .02$) and high ($z = 2.28$, $p < .05$) FEDUC groups.

Shifts in Means from Grade 5 to 7

Because of the larger number of groups for which results are given, the description and comparison of findings will be given for each goal separately except where group consistency was exhibited. Included in the description are the estimates of substantive significance which are given in Table 20.

Table 17

Summary of Across Time Correlations, Means, Dependent t for Difference Between Means, Standard Deviations, and Dependent t for Difference Between Variance for Students Whose Fathers Have Not Completed High School (N=182)

Goal	Np	r	Grade 5 Mean	Grade 7 Mean	t	Grade 5 SD	Grade 7 SD	t
I	172	.37	85.50	87.10	2.42	7.58	7.82	0.44
II	173	.21	32.13	33.88	3.74[b]	5.25	4.50	-2.06
III-V	170	.63	14.84	20.03	15.29[b]	4.90	5.33	1.43
III-M	171	.67	16.66	21.68	18.07[b]	4.44	4.45	0.04
IV	161	.33	57.52	58.16	0.78	9.07	8.99	-0.11
V	165	.50	158.21	160.86	1.55	21.84	21.96	0.08
VI	163	.57	26.93	31.14	8.65[b]	6.78	6.35	-0.10
VII	167	.42	136.17	140.80	3.72[b]	15.02	14.75	-0.26
VIII	163	.35	58.91	61.93	7.02[b]	4.75	4.86	0.31
IX	172	.24	51.79	50.81	-1.85	4.76	6.35	3.92[b]
X	164	.24	99.80	107.71	5.61[b]	15.08	14.14	-0.84

a = obtained difference significant at .01 level.
b = obtained difference significant at .001 level.

Np = number of paired observations

Table 18

Summary of Across Time Correlations, Means, Dependent t for Difference Between Means, Standard Deviations, and Dependent t for Difference Between Variances for Students Whose Fathers Have a High School Diploma (N=197)

Goal	Np	r	Grade 5 Mean	Grade 7 Mean	t	Grade 5 SD	Grade 7 SD	t
I	187	.58	88.32	89.43	1.99	8.20	8.51	0.61
II	189	.13	33.23	34.33	2.14	5.80	4.85	-2.50
III-V	183	.62	16.50	22.10	17.10[b]	5.28	4.82	-1.59
III-M	185	.60	17.98	22.65	17.06[b]	4.17	4.21	0.14
IV	186	.31	60.89	58.08	-3.51[b]	9.37	9.26	-0.17
V	186	.39	165.01	165.90	0.50	22.08	21.99	-0.07
VI	179	.57	29.15	33.73	9.88[b]	6.94	6.39	-1.36
VII	190	.45	142.39	143.42	0.88	15.85	14.79	-1.06
VIII	190	.37	59.96	64.54	9.86[b]	5.62	5.80	0.45
IX	186	.33	52.14	51.69	-0.97	5.12	5.82	1.85
X	185	.39	100.83	105.09	3.33[a]	15.78	15.64	-0.13

a = obtained difference significant at .01 level.
b = obtained difference significant at .001 level.
Np = number of paired observations.

Table 19

Summary of Across Time Correlations, Means, Dependent t for Difference Between Means, Standard Deviations and Dependent t for Difference Between Variances for Students Whose Fathers Received Advanced Education (N=128)

Goal	Np	r	Grade 5 Mean	Grade 7 Mean	t	Grade 5 SD	Grade 7 SD	t
I	122	.58	90.02	92.32	3.37[a]	8.39	7.95	-0.72
II	123	.34	34.41	35.84	3.32[a]	4.44	3.83	-1.74
III-V	122	.68	18.93	24.19	15.01[b]	5.25	4.09	-3.81[b]
III-M	122	.62	19.57	23.99	14.10[b]	4.14	3.81	-1.17
IV	125	.48	61.18	59.35	-2.13	9.18	9.66	0.64
V	125	.56	171.76	172.34	0.33	21.33	20.14	-0.78
VI	121	.52	32.14	36.22	9.03[b]	5.37	4.73	-1.63
VII	123	.49	145.66	145.89	0.16	16.96	15.44	-1.18
VIII	124	.52	62.36	66.51	8.71[b]	4.99	5.76	1.87
IX	124	.35	52.19	51.71	-0.81	5.24	6.15	1.88
X	121	.22	103.19	106.04	1.68	16.00	13.87	-1.60

a = obtained difference significant at .01 level.
b = obtained difference significant at .001 level.

Np = number of paired observations.

Table 20

Substantive Significance of Grade 5-7 Mean Shifts

at Each Goal Area for Levels of Father's Education

Group	I	II	III-V	III-M	IV	V	VI	VII	VIII	IX	X
Low	.18	.28	1.17	1.38	.06	.12	.68	.29	.55	.14	.44
Middle	.15	.16	1.26	1.25	.26	.04	.74	.06	.72	.07	.24
High	.27	.30	1.36	1.28	.19	.03	.82	.01	.78	.07	.15

As demonstrated by analyses in previous chapters large effects were found across groups for Goals III-V and III-M while moderate to large effects were found for Goals VI and VIII. Also consistent with previous results was the lack of significant change at Goals V and IX.

For Goal I a significant increase occurred only in the high FEDUC group. The obtained difference qualifies as a small effect according to d. It should be pointed out that, although the observed change for the low and middle groups did not reach the significance criterion of .01, there was a gain in each case. This finding conflicts with the decrease observed by Trowbridge (1972) with essentially the same instrument given to children in grades 3 through 8. Furthermore, as will be seen below, the self concept scores show a monotonic increase as FEDUC increases. By contrast the Trowbridge study found low socioeconomic children displaying higher means than a middle socio-economic group.

Statistically significant gains of a small effect size were found in the low and high groups for Goal II.

The only significant change at Goal IV occurred for the middle FEDUC group. Here, a decrement of a small effect size was formed.

For Goal VII only the low FEDUC group exhibited a significant shift. The observed gain is the small effect range.

Significant increases at Goal X were observed for the low and middle FEDUC groups. The gain for the low group approaches a medium effect size while a small effect was attained by the middle FEDUC group.

Differences in Mean Goal Scores for Father's Education Groups

A perusal of Tables 17, 18 and 19 demonstrates once again the powerful effect of a socioeconomic variable. With rare exception the means show an increase as socioeconomic status increases. This is true at both grade levels. In some instances the mean at grade 5 for the high FEDUC group exceeded the grade 7 mean for the other two groups.

One way analyses of variance were conducted at each goal/grade area. All revealed significant F ratios except Goals IX and X (both grades) and Goal IV (grade 7). As a follow up, the t' statistic was computed for each pair of groups. These results are displayed in Tables 21, 22 and 23. All 22 goal/grade variables are presented for the sake of consistency with previous tables.

Obviously, the largest differences occur between the high-low FEDUC groups. As Table 21 depicts, all differences were statistically significantly significant with the exception of Goal IV at grade 7 and Goals IX and X. Of the 17 significant contrasts five reach Cohen's guideline for a large effect ($r = .37$, $r^2 = .17$) and eight others reach criterion for a medium effect ($r = .24$, $r^2 = .06$). The remaining four exceed the minimum for a small effect ($r = .10$, $r^2 = .01$). For Goal IV the means differed significantly at grade 5 but not at grade 7. This was brought about by a non-significant increase (see Table 17) in the Goal IV mean for the low group and a non-significant decrease (see Table 19) for the high group.

As shown in Table 22, 12 contrasts were statistically significant in the high-middle FEDUC groups. All of these are small effects. The high FEDUC group had significantly greater means at both grade levels for Goals III-V,

Table 21

Summary of High-Low FEDUC Mean Contrasts

Goal	Grade	t'	df'	r	r^2
I	5	4.73b	244	.27	.07
I	7	5.58b	258	.31	.10
II	5	4.02b	285	.22	.05
II	7	4.02b	285	.22	.05
III-V	5	6.74b	249	.37	.14
III-V	7	7.54b	289	.39	.15
III-M	5	5.76b	271	.32	.10
III-M	7	4.78b	281	.26	.07
IV	5	3.37b	265	.20	.04
IV	7	1.07	257	.06	.00
V	5	5.30b	270	.30	.09
V	7	4.62b	278	.26	.07
VI	5	7.22b	281	.38	.15
VI	7	7.74b	282	.40	.16
VII	5	4.94b	244	.28	.08
VII	7	2.83a	256	.17	.03
VIII	5	5.93b	258	.33	.11
VIII	7	7.12b	239	.40	.16
IX	5	0.66	249	.04	.00
IX	7	1.23	270	.07	.00
X	5	1.81	250	.11	.01
X	7	-1.00	261	.06	.00

a = obtained difference significant at .01 level
b = obtained difference significant at .001 level

Table 22

Summary of High-Middle FEDUC Mean Contrasts

Goal	Grade	t'	df'	r'	r^2
I	5	1.76	255	.10	.01
I	7	3.03a	271	.17	.03
II	5	2.02	302	.11	.01
II	7	3.06a	299	.16	.03
III-V	5	3.94b	260	.22	.05
III-V	7	4.06b	286	.22	.05
III-M	5	3.29b	260	.18	.03
III-M	7	2.89a	276	.16	.03
IV	5	0.28	270	.02	.00
IV	7	1.16	258	.07	.00
V	5	2.70a	272	.15	.02
V	7	2.66a	281	.15	.02
VI	5	4.20b	293	.23	.05
VI	7	3.88b	295	.21	.04
VII	5	1.71	248	.10	.01
VII	7	1.42	253	.08	.01
VIII	5	3.96b	284	.21	.04
VIII	7	2.95a	264	.16	.03
IX	5	0.08	259	.00	.00
IX	7	0.03	254	.00	.00
X	5	1.27	254	.07	.00
X	7	0.56	277	.03	.00

a = obtained difference significant at .01 level
b = obtained difference significant at .001 level

Table 23

Summary of Middle-Low FEDUC Mean Contrasts

Goal	Grade	t'	df'	r	r^2
I	5	3.38b	357	.18	.03
I	7	2.71a	357	.14	.02
II	5	1.89	360	.10	.01
II	7	0.90	360	.05	.00
III-V	5	3.07a	351	.16	.03
III-V	7	3.83b	341	.20	.04
III-M	5	2.88a	347	.15	.02
III-M	7	2.12	348	.11	.01
IV	5	3.40b	341	.18	.03
IV	7	-0.08	340	-.00	.00
V	5	2.90a	345	.15	.02
V	7	2.15	344	.11	.01
VI	5	2.98a	338	.16	.03
VI	7	3.77b	337	.20	.04
VII	5	3.81b	353	.20	.04
VII	7	1.67	349	.09	.01
VIII	5	1.91	351	.10	.01
VIII	7	4.60b	351	.23	.05
IX	5	0.67	356	.04	.00
IX	7	1.36	347	.07	.00
X	5	0.63	345	.03	.00
X	7	-1.65	347	-.09	.01

a = obtained difference significant at .01 level.
b = obtained difference significant at .001 level.

III-M, V, VI and VIII. For Goals I and II the two groups were not significantly different at grade 5 but do diverge significantly at grade 7. In both cases the high group displayed significant increases (see Table 19) while the middle group did not (see Table 18). This provides some evidence for a disordinal interaction, with the high group demonstrating a gain in these two areas while the low group did not.

Eleven of the comparisons between the middle and low FEDUC groups (see Table 23) were statistically significant. The middle FEDUC groups had significantly larger means at both grade levels for goals I, III-V, and VI. Of interest is the fact that the middle group showed a significant decrease at goal IV while no significant change took place for the low group. The difference between the groups at grade 5 was significant. This would indicate that the low group maintained the same level of interest in school whereas the middle group showed a decrease in interest. The low group was significantly lower in Goal VII at grade 5, but not significantly different at grade 7. Although both groups gained in Goal VIII, the low FEDUC group appears to have achieved a greater increase. The two groups did not depart significantly at grade 5 but do differ significantly at grade 7.

Shifts in Variability from Grade 5 to 7

Essentially no changes in variability occurred for the three groups. Only two significant shifts out of 33 comparisons were noted, the incidence being at a chance level. One of these occurred for Goal III-V in the high FEDUC group (Table 19). The observed decrease in variability is undoubtedly due to a ceiling effect. A significant increase in variability was found for Goal IX in the low FEDUC group.

Differences in Variability Between FEDUC Groups

Again the general theme was close comparability among variances. The only significant difference across groups took place at Goal II, III-V, VI and VIII. At Goal II, the middle FEDUC group was more variable than the high group at grade 5 ($F = 1.71$, $df = 189, 123$, $p < .001$) and grade 7 ($F = 1.60$, $df = 189, 132$, $p < .01$). Greater variability was also exhibited by the middle group over the high group at grade 5 ($F = 1.67$, $df = 179, 121$, $p < .001$) and grade 7 ($F = 1.82$, $df = 179, 121$, $p < .001$). The low FEDUC group also demonstrated more variability than the high group on Goal VI at grade 5 ($F = 1.57$, $df = 163, 121$, $p < .01$) and grade 7 ($F = 1.81$, $df = 163, 121$, $p < .001$). The lone significant difference for Goal III-V occurred at grade 7. Here the low group exhibited greater variability than the high group ($F = 1.70$, $df = 170, 122$, $p < .001$); however, the latter group was running into a ceiling effect which naturally incurs a restriction of range. The middle FEDUC group was more variable than the low group in Goal VIII at grade 5 ($F = 1.40$, $df = 172, 186$, $p < .01$) and grade 7 ($F = 1.42$, $df = 172, 186$, $p < .01$).

As will be noted, the magnitude of these variances ratios is not great. One may conclude that, for these data, no important discrepancies in variability were found.

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APPENDIX

INFORMATION ON TEST BATTERY USED IN LONGITUDINAL STUDY

The following is a brief description of the instrument used at each goal area. Internal consistency estimates of reliability derived from the Phase II norming operation are included along with the number of items and and possible score range. The source of each instrument is also identified. Most of the information has been abstracted from Beers (1970) and Burson (1972).

Goal I: Self Concept

Number of items: 53

Possible score range: 53-106

Reliability (Coefficient alpha): .87

Source: 45 items from Coopersmith's (1967) Self Esteem Inventory plus 8 items pertaining to "control of environment" were obtained from Educational Testing Service.

Description: The items reflect the following content areas: (1) control of environment--feelings of confidence in one's ability to fulfill ambitions, (2) self-confidence in personal attributes--feelings of self worth, (3) achieving in school--one's self image in relation to teachers and the school setting, (4) relating to others--one's relationship with parents and peers.

Goal II: Understanding Others

Number of items: 9

Possible score range: 9-45

Reliability (Coefficient alpha): .77

Source: Items were developed by Educational Testing Service and later revised by Educational Quality Assessment.

Description: Items pertain to attitudes toward those who differ in race, religion, and economic status.

Goal III-V: Basic Skills - Verbal

Number of items: 30

Possible score range: 0-30

Reliability (KR-20): .75

Source: Educational Testing Service

Description: Items are verbal analogies.

Goal III-M: Basic Skills - Math

Number of items: 30

Possible score range: 0-30

Reliability (KR-20): .75

Source: Educational Testing Service

Description: Items pertain to computational skills and problem solving.

Goal IV: Interest in School

Number of items: 17

Possible score range: 17-85

Reliability (Coefficient alpha): .75

Source: Developed by Educational Testing Service and later modified by Educational Quality Assessment.

Description: The items correspond to the following content areas: (1) perception of the school climate--attitudes about teachers, school facilities and course offerings, (2) attitude toward school assignments--opinions about homework, reading, writing and studying, (3) perception of the learning process--attitudes about teacher methods and school in general.

Goal V: Citizenship

Number of items: 44

Possible score range: 44-220

Reliability (Coefficient alpha): .90

Source: Bureau of Educational Research

Description: The general item content is as follows: (1) Situational ethics--what one would do when confronted with cheating, rule-breaking, losing or finding articles and helping others, (2) Attitudes toward personal responsibility issues--what one's attitude is toward cheating, rule-breaking, etc., (3) Concern for democratic principles--opinions on civil rights, freedom of speech, etc., (4) Initiative in advocating change--would one criticize established order to effect change.

Goal VI: Health Habits

Number of items: 48

Possible score range: 0-48

Reliability (KR-20): .82

Source: 35 items were adapted from the Health and Safety Education Test, Psychometric Affiliates and the remaining 13 items were prepared by Educational Quality Assessment.

Description: Items tap knowledge of desirable health habits in areas of personal hygiene, first aid, food and nutrition, alcohol, smoking, drugs and environment hazards.

Goal VII: Creativity

Number of items: 39

Possible score range: 39-195

Reliability (Coefficient alpha): .82

Source: Bureau of Research

Description: Items pertain to one's willingness to take risks and engage complex ideas, curiosity, degree of self direction and extent of flexible thinking.

Goal VIII: Vocational Development

Number of items: 39

Possible score range: 39-78

Reliability (Coefficient alpha): .77

Source: 39 items from the Crites (1969) Vocational Development Inventory.

Description: Items measure maturity of attitudes toward a career choice and the development of educational/occupational plans. The relative importance of work and the satisfactions derived are also measured.

Goal IX: Appreciating Human Accomplishments

Number of items: 21

Possible score range: 21-63

Reliability (Coefficient alpha): .79

Source: Bureau of Educational Quality Assessment

Description: Items tap the perceived importance and degree of desired participation in political, scientific, sports, literature, art, music and theater activities.

Goal X: Preparing for a Changing World

Number of items: 29

Possible score range: 29-145

Reliability (Coefficient alpha): .79

Source: Bureau of Educational Quality Assessment

Description: Items require students to project themselves into the future and indicate their degree of comfort with sweeping changes in societal regulations. Content includes the perceived importance of continued education in coping with change, opinions regarding changes in school, work and travel regulations and attitude toward change in school setting and instructional methods.